Claims

1. A method for estimating a distance between stations communicating in a communication system over a radio interface, wherein at least one of the stations transmits signal bursts in time slots in accordance with a timing structure and at least one station receives the signal bursts, said method comprising the steps:

determining a first timing of a signal burst received from a transmitting station at a receiving station, the first timing being associated with the first component of the received signal burst that meets a predefined condition;

determining a second timing of the received signal burst, said second timing being for use in adjustment of internal timing of the receiving station for communicating further signal bursts with the transmitting station;

determining timing delay information for the communication between the transmitting and receiving stations; and

estimating the distance between the transmitting and receiving stations based on said timing delay information and information about the first timing of the received signal burst.

2. A method according to claim 1, comprising determining a difference between the first timing and the second timing, wherein the determined difference is used as a correction value in the estimation of the distance between the stations.

3. A method according to claim 1, wherein a timing advance value that is based on the timing delay information is used in said estimation of the distance, comprising:

determining a difference between the first timing and the second timing; and

subtracting the difference between the first timing and the second timing from the timing advance value.

4. A method according to any of the preceding claims, wherein the respective timings are determined by means of an impulse response of the received signal burst.

5. A method according to claim 4, wherein the determination of the second timing is based on the mass center of the impulse response.

6. A method according to claim 4 or 5 when appended to claim 2 or 3, wherein the receiving station determines the difference between the first timing and the second timing.

7. A method according to claim 6, wherein the receiving station transmits the determined difference between the first timing and the second timing to the transmitting station for processing.

8. A method according to any of claims 1 to 5, comprising:

use of different reception and transmission timings at the receiving station, wherein the reception timing of the receiving station is adjusted in accordance with the determined second timing and the transmission timing for transmitting a response signal from the receiving station to the transmitting station is adjusted in accordance with the determined first timing;

receiving the response signal at the transmitting station;

determining at the transmitting station a timing of the received response signal such that the timing is based on a component of the received response signal corresponding said first component; and

determining a difference between the transmission timing and the timing of the received response signal.

9. A method according to claim 8, wherein the receiving station informs the communication system that it uses different reception and transmission timings.

10. A method according to any of the preceding claims, wherein the receiving station comprises a mobile station of a cellular communication system and the transmitting station comprises a base station of the cellular communication system.

11. A method according to any of claims 1 to 5 or 8, wherein the receiving station comprises a base station of a cellular communication system and the transmitting station comprises a mobile station of the cellular communication system.

12. A method according to claim 11, wherein the difference between the timings is subtracted from the timing advance by the base station.

13. A method according to any of the preceding claims, wherein the predefined condition is met by the signal component of the signal burst that arrives as a first detectable component of the transmission.

14. A method according to any of the preceding claims, wherein the predefined condition comprises a threshold value for the components.

15. A method according to any of the preceding claims, wherein one of the stations is a mobile station of a cellular communication system and at least one of the stations is a

fixedly positioned base station, further comprising a step of determining the current geographical location of the mobile station by means of the distance between the mobile station and said at least one base station.

16. A method according to claim 15, further comprising step of:

determining at least one further distance between the mobile station and at least one further base station; and

combining the results of the at least two determinations for estimating the current geographical location of the mobile station.

17. A method according to any of the preceding claims, wherein one of the stations is a mobile station, comprising step of combining the result of the estimation of the distance between the mobile station and another station with at least one further result obtained from another determination relating to the location of the mobile station.

18. A method according to any of the preceding claims, comprising communicating information of at least one of the accomplished determinations to a location service node of the communication system.

19. A communication system comprising:

a transmitting station arranged to transmit signal bursts over time slots in accordance with a timing structure of the communication system;

a receiving station arranged to receive the signal bursts;

control means for determining a first timing of a signal burst received at the receiving station, the first timing being

associated with the first component of the received signal that meets a predefined condition;

control means for determining a second timing of the received signal burst for use in adjustment of the receiving station for receiving and/or transmitting further signal bursts;

control means for determining timing delay information for communication between the stations; and

control means for estimating a distance between the stations based on the timing delay information and information about the first timing.

20. A communication system according to claim 19, wherein the control means for estimating the distance are arranged further to determine a difference between the first timing and the second timing and to correct an initial estimate of the distance between the stations on the basis of the determined difference.

21. A communication system according to claim 19, wherein the control means for estimating the distance are arranged to base the distance estimation on a timing advance value derived from the timing delay information, to determine a difference between the first timing and the second timing, and to subtract the difference between the first timing and the second timing from the timing advance value.

22. A communication system according to any of claims 19 to 21, wherein the control means for determining the timings are arranged to make use of an impulse response of the received signal burst.

23. A communication system according to claim 22, wherein the determination of the second timing is based on the mass center

of the impulse response and the determination of the first timing is based on the first component of the signal to arrive.

24. A communication system according to any of claims 19 to 23, wherein the receiving station is arranged to use different timings for reception and transmission.

25. A communication system according to any of claims 19 to 24, wherein the receiving station comprises a mobile station of a cellular communication system and the transmitting station comprises a base station of the cellular communication system.

26. A communication system according to any of claims 19 to 24, wherein the receiving station comprises a base station of a cellular communication system and the transmitting station comprises a mobile station of the cellular communication system.

27. A communication system according to any of claims 19 to 24, wherein one of the stations is a mobile station of a cellular communication system and at least one other of the stations is a fixedly positioned base station, further comprising means for determining the current geographical location of the mobile station by means of the distance between the mobile station and said at least one base station.

28. A communication system according to any of claims 19 to 27, comprising further a location service node for providing geographical location information.